NAVFAC
Naval Facilities Engineering Command
BRAC PMO West

IR-03 Pilot Study Update

BCT Meeting

Hunters Point Naval Shipyard

July 2, 2014

Presentation Overview

- ISTR Pilot Study Update
- ISS Pilot Study Update
- Pilot Study Performance Objectives
- Technology Performance Monitoring
- Summary

ISTR Pilot Study Update

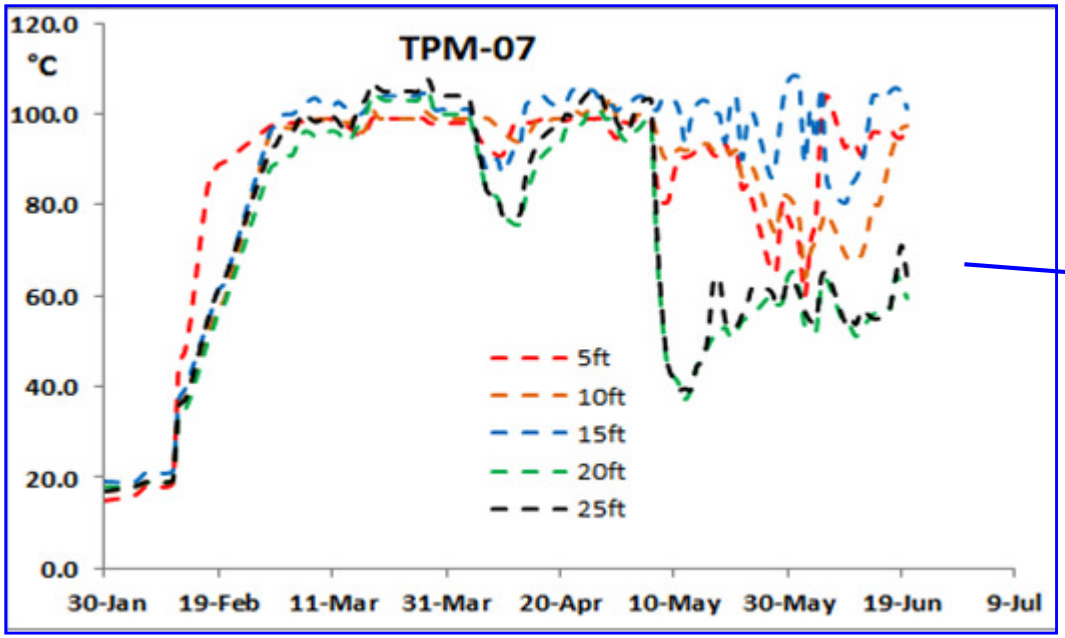
Observations Reported Since the Last BCT Meeting

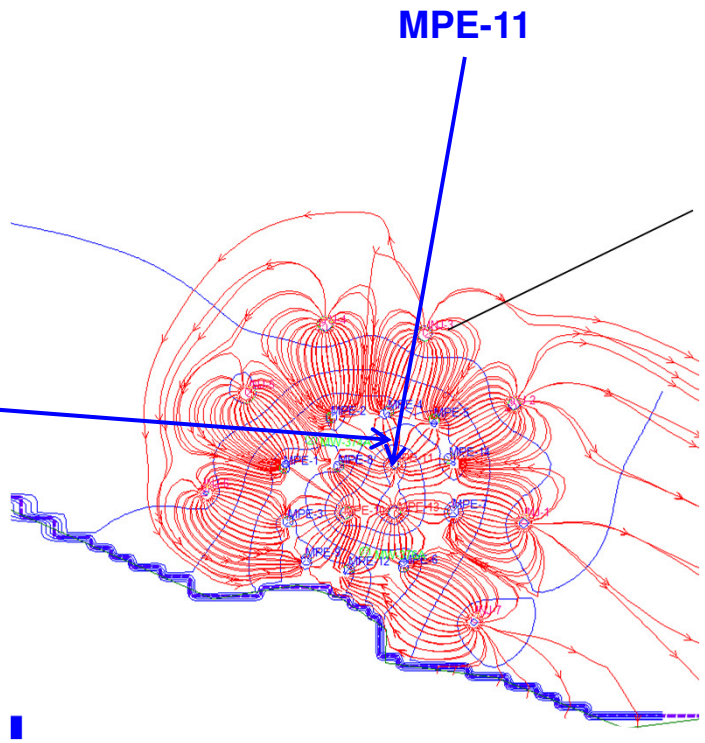
- Last BCT Meeting, discussed as of 5/26/2014 (110 days of operation)
  - –635,000 gallons of water have been recirculated (~4.2 pore volumes)
  - –2,336 gallons of NAPL had been extracted
- As of 6/30/2014 (145 days of operation):
  - –820,000 gallons of water have been recirculated (~5.5 pore volumes)
  - –2,400 gallons of NAPL have been extracted
- Operations continue with temperatures typically 95-100+˚C

LNAPL
February 11, 2014

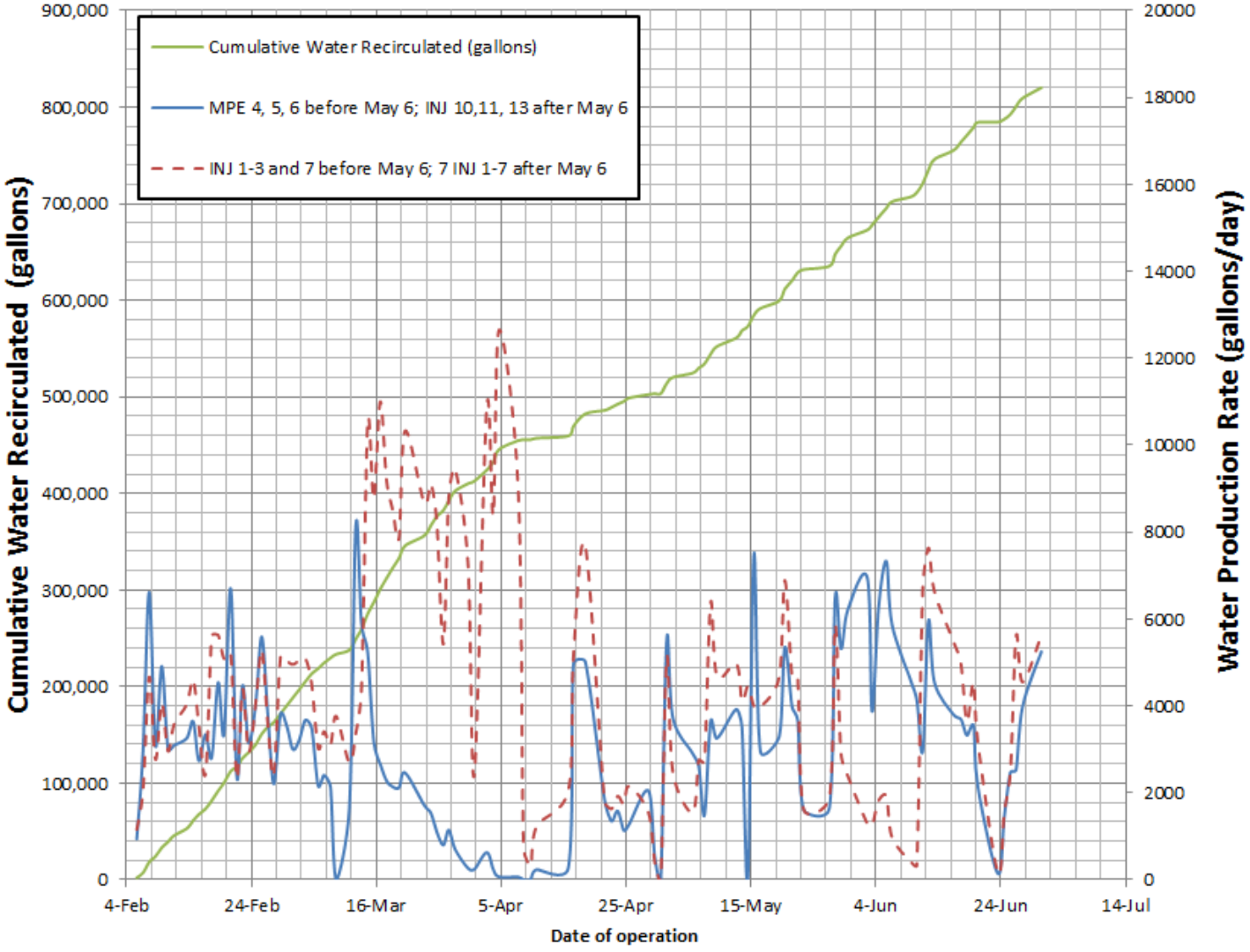
ISTR System Operation: Recirculation Modifications

- Operated with a “Dual Recirculation” system since May 8
- Turned off injection into MPE 11 to try to increase the temperature in the more conductive zone on June 19, 2014
  - –No significant increase in NAPL extraction observed

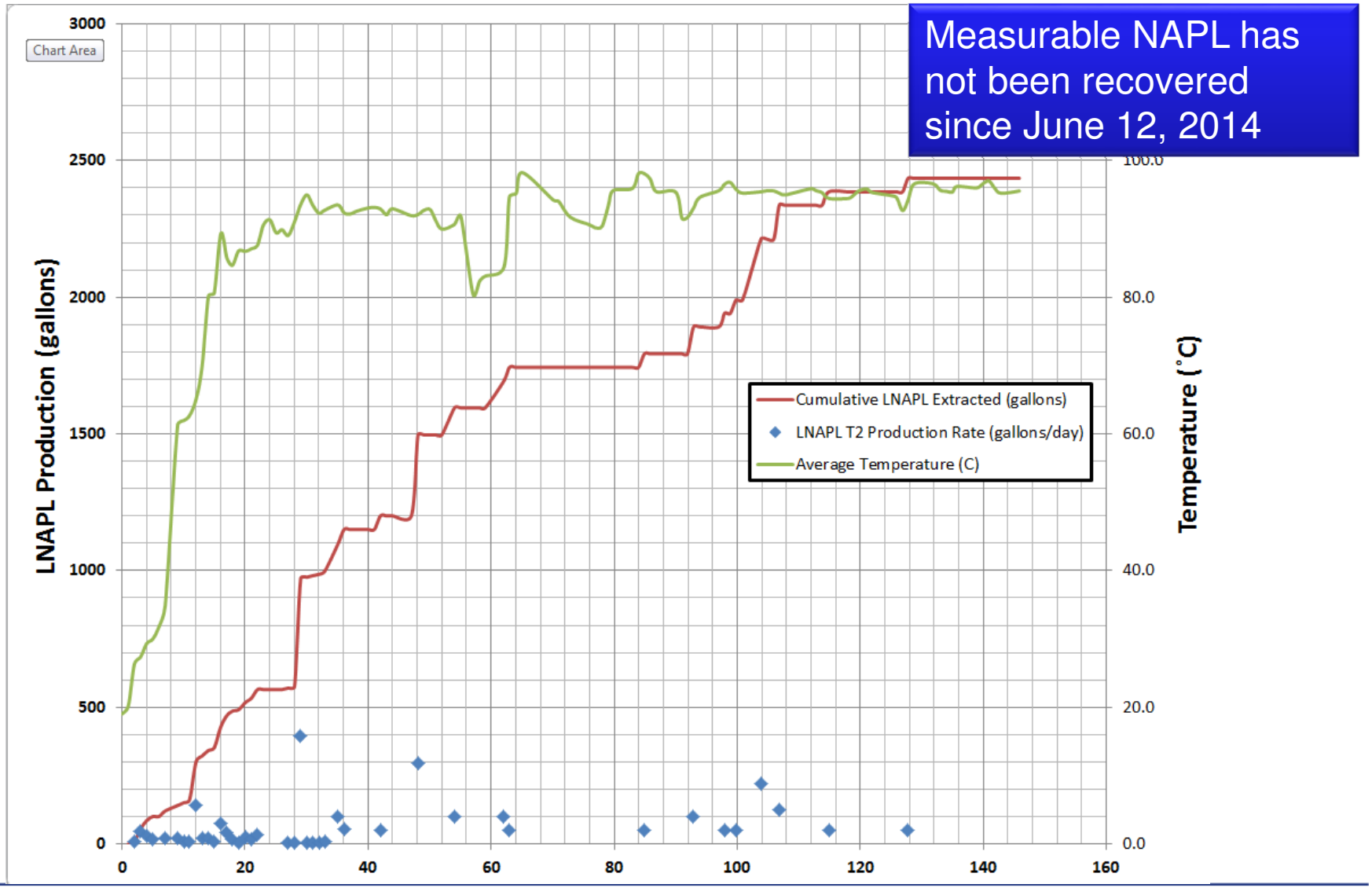




ISTR System Operation: Recirculation System Volumes and Rates



ISTR System Operation: NAPL Removal



Measurable NAPL has not been recovered since June 12, 2014

ISTR System Shutdown

- As of June 30, No measurable NAPL has been removed in 18 days
  - Approximately 146,000 gallons (about 1 pore volume) of water has been circulated with no measurable NAPL collected

- The Navy recommends shutting the system down on July 7

Month	NAPL Extracted (gal)	Approximate Average Cost per Gallon of Extracted NAPL
February	583	$ 429
March	1030	$ 243
April	198	$ 1,265
May	593	$ 422
June	49	$ 5,061

ISS Pilot Study Update

ISS Field Activities

- Well Destruction of IR03MW370A (total depth 23.5 feet bgs) – all material was successfully removed
- Logging of IR03MW370A boring
  - –Bay Mud from 23.5 to >50 feet bgs
  - –No sand layers were encountered within the Bay Mud
- Top of sheet pile wall located at 2 feet bgs
- 5 ISS columns successfully completed to approximately 44 feet bgs; 48 feet bgs was not feasible due to safety concerns
- Column mixes appeared thicker and dryer than expected

ISS Field Activities

Metal debris found during excavation

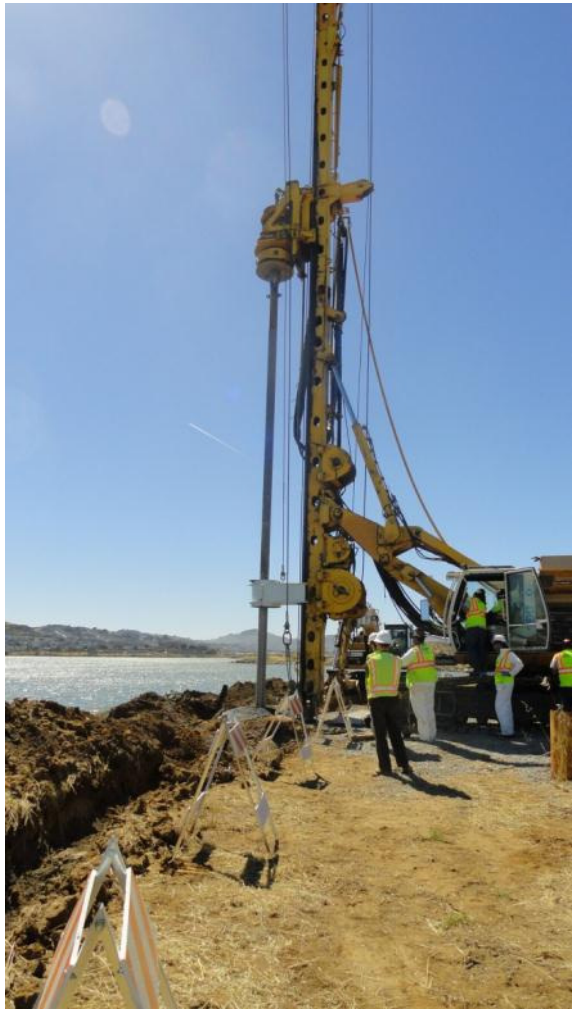
Top of Sheet Pile Wall. Orange Marker – location of IR03MW370A

ISS Field Activities

Mud Balance
Measurement of Bentonite Slurry Density and cement grout Specific Gravity

Marsh Funnel
Bentonite Slurry Viscosity

ISS Field Activities



ISS Pilot – Drilling Operations

ISS Column – Thick/Dry/ Homogeneous

ISS Column Auger/ Mixing Tool

ISS Field Activities

ISS Column – Close up of Mixing

Cable wrapped on Drilling Auger

ISS Field Activities

ISS Column Sampler

ISS Column Sampler - every 10 feet bgs

ISS Field Activities

Restored ISS site with marked-out column locations

Pilot Study Performance Objectives

NAPL Treatment Pilot Study Performance Objectives and Performance Metrics

Technology	Type of Technology	Performance Objective	Performance Metrics
ISTR	LNAPL mass recovery technology	Extract and treat all mobile NAPL within Target Treatment Zone	Reduce average total LNAPL saturation in soil to levels below residual saturation[1]. Reduce LNAPL saturation to levels that would result in maximum concentrations of COECs[2] below water quality criteria for aquatic wildlife (**Table 3-2**) and TPH less than 1,400 µg/L in groundwater discharging to the Bay.
ISS	LNAPL mass control technology	Reduce LNAPL mobility through reducing permeability and contaminant leachability within the Target Treatment Zone.	Reduce permeability in the Target Treatment Zone to 10^{-6} to 10^{-7} cm/sec. Reduce leachability of LNAPL to achieve maximum concentrations of COECs below water quality criteria for aquatic wildlife (**Table 3-2**) and TPH to less than 1,400 µg/L in groundwater discharging to the Bay.

[1]IR-03 LNAPL total and residual saturation levels within the ISTR treatment zone will be quantified during the pre-design characterization. The ISTR treatment goal will be to reduce the total LNAPL saturation to levels below residual saturation, once both have been quantified.

[2]Note that while thermal treatment will reduce metals entrained within the LNAPL, it will not treat high metals contents associated with the soil.

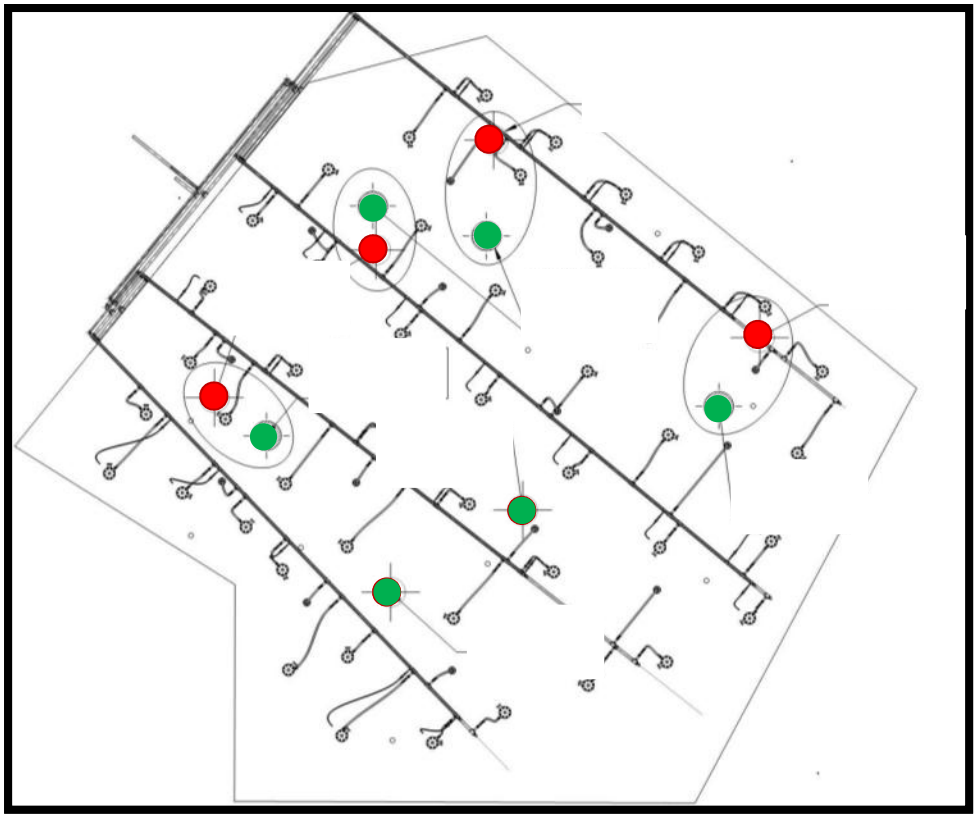
Technology Performance Monitoring

Post-ISTR Sampling

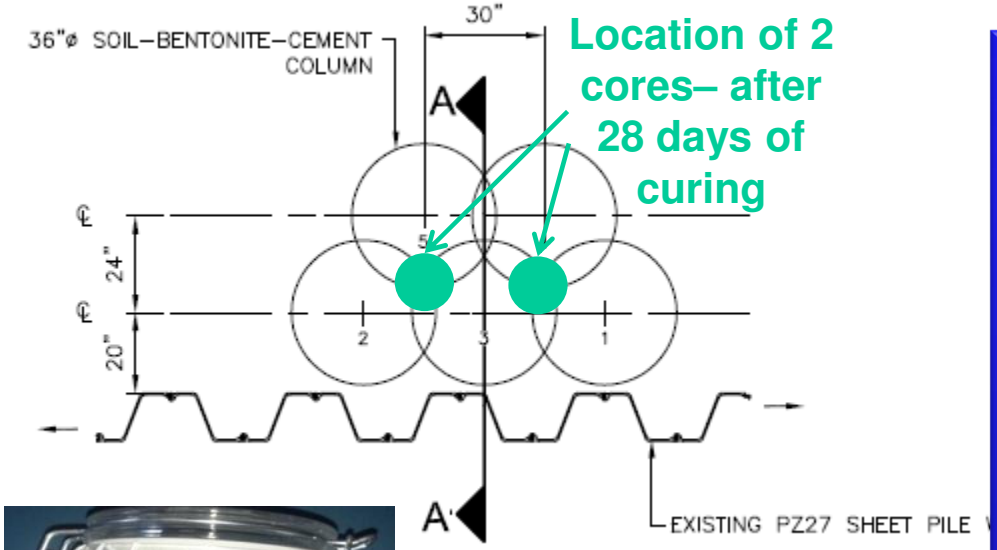
ISTR Performance Monitoring

- Sixty samples from at least six DPT Borings will be collected
- Samples will be analyzed for total, leachable and residual NAPL (18) and for COCs and COECs (10-60).

- Adjustments made to the locations based on Site conditions (rig access)
- Additional adjustments may be made in the field due to obstructions, refusal, etc.
- More than 6 borings may be advanced if recovery is low



Post Pilot Study Sampling



Location of 2 cores– after 28 days of curing

Photo of SDL columns and leaching vessel.

ISS Performance Monitoring

- Two borings (cores) will be advanced and evaluated for permeability and mix consistency
- 6 samples will be analyzed for strength, permeability, COC/COECs and SPLP
- Semi Dynamic Leaching (SDL) Test will be done on a selected sample based on results of 6 samples.

Summary

Summary

- **ISTR:**
  - –NAPL is no longer being extracted from the site
    - Operations to be ceased July 7
- **ISS:**
  - – ISS Columns Complete – June 20, 2014
    - Slurry viscosity (field) was within the specified range of 48-54 seconds and density (field) was within the specified range of 64-64.5 pounds per cubic feet
    - Less Depth of Bay Mud in the mix than planned due to safety limitations
    - Bay Mud was more homogenous than anticipated
      - –More clay and less sand may make for better metrics
    - Column mixes appeared thicker and dryer than expected

Schedule

Activity	Schedule
In Situ Thermal Remediation (ISTR) Operation	February 4 – July 7, 2014
In Situ Solidification/Stabilization (ISS) Field Work	June 16 – June 20, 2014
ISS Column Cure Period	June 20-July 21, 2014
Post-ISTR Sampling	July 7-18, 2014
Post-ISS Sampling	July 21-23, 2014
Draft Pilot Study Report	November 2014